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(54) Data processing system including a memory system.

(57) Combination of split memory modules, each module partitioned into a first section and a second section. Each module has its own power source (101, 103) so that the failure of a single power source will not affect the other modules. A particular block of data is not stored in both sections of a single module. Each modified block of data is stored in the first section of one module and the second section of a different module. Failure of a power supply will not cause a loss in data since the modified data is also stored in a section of a module not powered by the same power supply. The failure of all power supplies will not result in the loss of any data if either the first or second section of the memory modules is non-volatile, i.e., backed up, usually by battery sources.

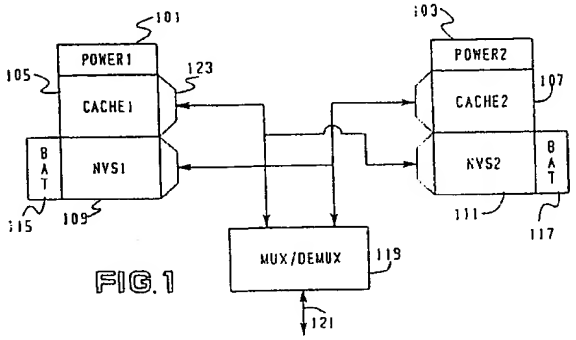

FIG.1

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designated, by way of example only, with reference to the accompanying drawings in which:

FIG. 1 is a block diagram of a memory system in accordance with the present invention; and

FIG. 2 is a block diagram of a computer system which may incorporate the present invention.

FIGURE 1 shows an embodiment of the invention using a pair of memory systems, each system comprising a cache memory and a non-volatile storage. Access to the memories for writing is such that the information is written into the cache memory of one system and at the same time, into the non-volatile storage of the other system. For example, information to be stored arriving on a system bus 121 is controlled by a multiplexor-de-multiplexor (MUX/DEMUX) 119. Information to be written is stored in a cache memory 105 via an interface 123 and, at the same time, stored in the non-volatile storage NVS2 111.

The power supplies for the separate systems are shown as POWER1 101 for the CACHE1 memory 105 and the NVS1 memory 109. Power supply POWER2 103 supplies power to the CACHE2 memory 107 and the NVS2 memory 111. A battery backup is supplied for the NVS1 memory 109 by a battery source 115. Battery source 117 backs up the non-volatile storage 111.

During normal operation, memory data is read to and from the cache memories 105 or 107 as determined by the MUX/DEMUX 119. Information that is written to the cache memories are also written to the opposite system non-volatile store. If the power supply fails for a particular system, then the data in the cache memory associated with the failed power supply can be read from the non-volatile storage in the other system. The cache memory for the non-volatile store and the system having a failed power supply is retained by means of the battery backup. If both power supplies fail, the information is still available from the non-volatile storages.

FIGURE 2 shows a larger memory system having three systems and a MUX/DEMUX 205 where the battery backup supplies from the non-volatile storages are not shown. A system bus 207 is shown coupled to a processor 203 and a DASD system 201 and the MUX/DEMUX 205 for the memory system. The cache memories, CACHE1, CACHE2, and CACHE3, are addressed by contiguous address fields under the control of the interface to each cache and the operation of the MUX/DEMUX 205. Similarly, the non-volatile storage systems, NVS1, NVS2 and NVS3, are similarly addressed except that the data stored in NVS1 contains the modified data that is stored in CACHE3, that NVS2 is similarly paired with CACHE1, and NVS3 is similarly paired with CACHE2. The power supplies, POWER1, POWER2 and POWER3, are independent from one another and cause a failure only in the system cache to which they supply power. As can be seen from FIGURE 2, the information stored in the memory can survive even if failure of all three power supplies using the arrangement shown.

Although the invention has been described in terms of cache memories and non-volatile storage, it is not intended to be limited to any particular type of memory.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes and modifications in form and details may be made therein without departing from the scope of the invention according to the following claims.

Claims

1. A data processing system including a memory system, the memory system comprising:

   a plurality of split memory modules for storing data in first and second sections;

   a plurality of power supplies, each for supplying power to one of the memory modules; and

   means for storing the same data in the first section of one of the memory modules and in the second section of a different one of the memory modules.

2. A data processing system as claimed in Claim 1 wherein the first sections of the memory modules comprise a cache memory and the second sections of the memory modules comprise a non-volatile memory.

3. A data processing system as claimed in Claim 2 further comprising:

   means for coupling each of the power supplies to a separate one of the cache memories and to a separate one of the non-volatile memories.

4. A data processing system as claimed in Claim 2 further comprising:

   transfer means for coupling addresses and data to or from a source in parallel to one of the cache memories and one of the non-volatile memories not coupled to the same power supply.

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EUROPEAN SEARCH REPORT

Application Number
EP 92 31 0401

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	COMPUTER SOCIETY INTERNATIONAL CONFERENCE (COMPCON). vol. 33, 1988, IEEE, WASHINGTON D.C., US pages 146 - 151 MENON ET AL. 'The IBM 3990 disk cache' * page 146, right column, line 24 - page 147, right column, line 13; figure 1 *	1,2	G06F11/20 G06F1/26 G11C5/14
Y	DE-A-3 311 881 (SHARP) * page 5, line 16 - page 7, line 21; figure 4 *	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G06F G11C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 FEBRUARY 1993	LEDRUT P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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